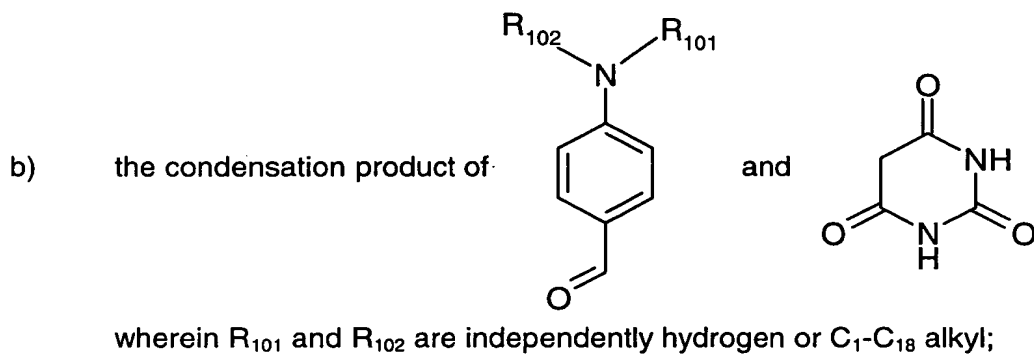


Claims

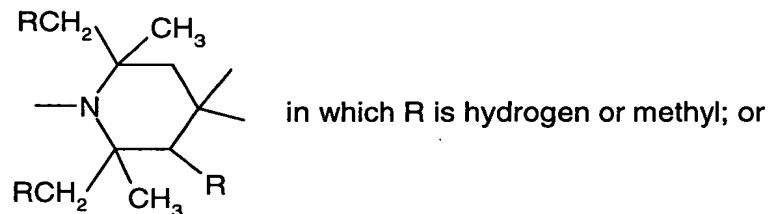
1. A polymer composition for agricultural applications in the form of films for greenhouses and small tunnel covers, films or filaments for shading nets and screens, mulch films, non-wovens or molded articles for the protection of young plants comprising

a) a thermoplastic polymer;

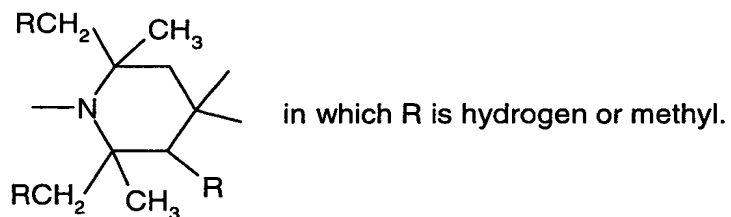


c1) a UV-absorber; or

c2) a sterically hindered amine, containing at least one radical of the formula

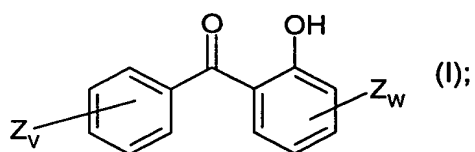


c3) a UV-absorber and a sterically hindered amine, containing at least one radical of the formula

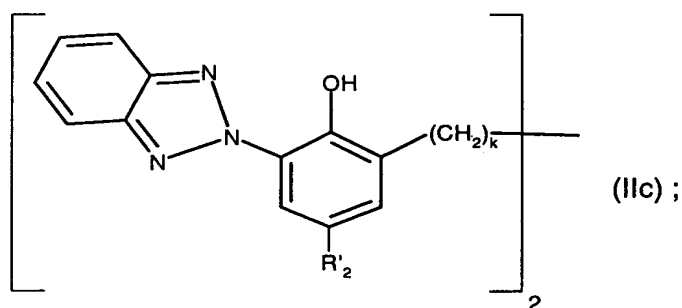
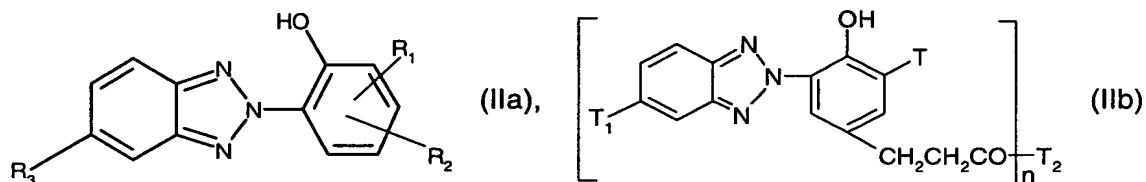


2. A polymer composition according to claim 1 wherein the UV-absorber is selected from the group consisting of benzotriazole UV-absorbers, benzophenone UV-absorbers, hydroxyphenyl-triazine UV-absorbers and oxalic anilide UV-absorbers or mixtures thereof.

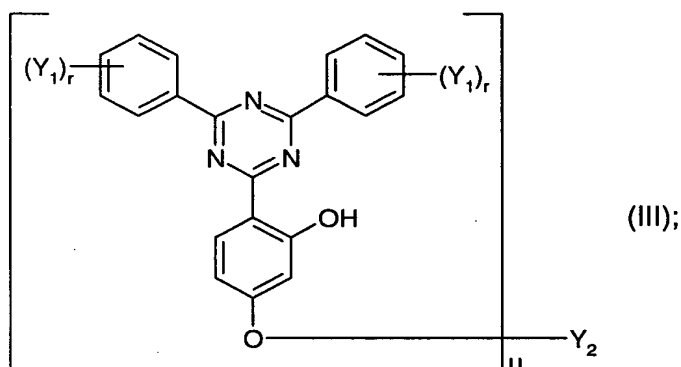
3. A polymer composition according to claim 2 wherein the hydroxybenzophenone is of formula I



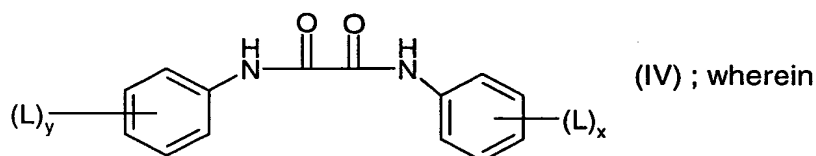
the 2-hydroxyphenylbenzotriazole is of formula IIa, IIb or IIc



the 2-hydroxyphenyltriazine is of formula III



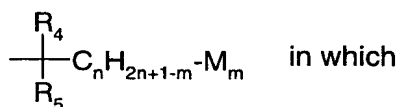
and the oxanilide is of formula (IV)



in the compounds of the formula (I) v is an integer from 1 to 3 and w is 1 or 2 and the substituents Z independently of one another are hydrogen, halogen, hydroxyl or alkoxy having 1 to 12 carbon atoms;

in the compounds of the formula (IIa),

R₁ is hydrogen, alkyl having 1 to 24 carbon atoms, phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety, cycloalkyl having 5 to 8 carbon atoms or a radical of the formula



R₄ and R₅ independently of one another are alkyl having in each case 1 to 5 carbon atoms, or R₄, together with the radical C_nH_{2n+1-m}, forms a cycloalkyl radical having 5 to 12 carbon atoms,

m is 1 or 2, n is an integer from 2 to 20 and

M is a radical of the formula -COOR₆ in which

R₆ is hydrogen, alkyl having 1 to 12 carbon atoms, alkoxyalkyl having in each case 1 to 20 carbon atoms in the alkyl moiety and in the alkoxy moiety or phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety,

R_2 is hydrogen, halogen, alkyl having 1 to 18 carbon atoms, and phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety, and

R_3 is hydrogen, chlorine, alkyl or alkoxy having in each case 1 to 4 carbon atoms or $-\text{COOR}_6$ in which R_6 is as defined above, at least one of the radicals R_1 and R_2 being other than hydrogen;

in the compounds of the formula (IIb)

T is hydrogen or alkyl having 1 to 6 carbon atoms,

T_1 is hydrogen, chlorine or alkyl or alkoxy having in each case 1 to 4 carbon atoms,

n is 1 or 2 and,

if n is 1,

T_2 is chlorine or a radical of the formula $-\text{OT}_3$ or $\begin{array}{c} \text{T}_4 \\ \diagup \\ \text{---N} \\ \diagdown \\ \text{T}_5 \end{array}$ and,

if n is 2, T_2 is a radical of the formula $\begin{array}{c} \diagup \quad \diagdown \\ \text{N} \quad \text{T}_{10} \quad \text{N} \\ \diagdown \quad \diagup \\ \text{T}_6 \quad \text{T}_6 \end{array}$ or $-\text{O-T}_9-\text{O-}$;

in which

T_3 is hydrogen, alkyl which has 1 to 18 carbon atoms and is unsubstituted or substituted by 1 to 3 hydroxyl groups or by $-\text{OCOT}_6$, alkyl which has 3 to 18 carbon atoms, is interrupted once or several times by $-\text{O-}$ or $-\text{NT}_6-$ and is unsubstituted or substituted by hydroxyl or $-\text{OCOT}_6$, cycloalkyl which has 5 to 12 carbon atoms and is unsubstituted or substituted by hydroxyl and/or alkyl having 1 to 4 carbon atoms, alkenyl which has 2 to 18 carbon atoms and is unsubstituted or substituted by hydroxyl, phenylalkyl having 1 to 4 carbon atoms in the alkyl

moiety, or a radical of the formula $-\text{CH}_2\text{CH}(\text{OH})-\text{T}_7$ or $\begin{array}{c} \text{O} \\ \diagup \quad \diagdown \\ \text{---C---CH---CH}_2 \\ \text{H}_2 \end{array}$,

T_4 and T_5 independently of one another are hydrogen, alkyl having 1 to 18 carbon atoms, alkyl which has 3 to 18 carbon atoms and is interrupted once or several times by $-\text{O-}$ or $-\text{NT}_6-$, cycloalkyl having 5 to 12 carbon atoms, phenyl, phenyl which is substituted by alkyl having 1 to 4 carbon atoms, alkenyl having 3 to 8 carbon atoms, phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety or hydroxyalkyl having 2 to 4 carbon atoms,

T_6 is hydrogen, alkyl having 1 to 18 carbon atoms, cycloalkyl having 5 to 12 carbon atoms,

alkenyl having 3 to 8 carbon atoms, phenyl, phenyl which is substituted by alkyl having 1 to 4 carbon atoms, phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety,

T₇ is hydrogen, alkyl having 1 to 18 carbon atoms, phenyl which is unsubstituted or substituted by hydroxyl, phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety, or -CH₂OT₈,

T₈ is alkyl having 1 to 18 carbon atoms, alkenyl having 3 to 8 carbon atoms, cycloalkyl having 5 to 10 carbon atoms, phenyl, phenyl which is substituted by alkyl having 1 to 4 carbon atoms, or phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety,

T₉ is alkylene having 2 to 8 carbon atoms, alkenylene having 4 to 8 carbon atoms, alkynylene having 4 carbon atoms, cyclohexylene, alkylene which has 2 to 8 carbon atoms and is interrupted once or several times by -O-, or a radical of the formula -CH₂CH(OH)CH₂OT₁₁OCH₂CH(OH)CH₂- or -CH₂-C(CH₂OH)₂-CH₂-,

T₁₀ is alkylene which has 2 to 20 carbon atoms and can be interrupted once or several times by -O-, or cyclohexylene,

T₁₁ is alkylene having 2 to 8 carbon atoms, alkylene which has 2 to 18 carbon atoms and is interrupted once or several times by -O-, 1,3-cyclohexylene, 1,4-cyclohexylene, 1,3-phenylene or 1,4-phenylene, or

T₁₀ and T₆, together with the two nitrogen atoms, are a piperazine ring;

in the compounds of formula (IIc)

R'₂ is C₁-C₁₂alkyl and k is a number from 1 to 4;

in the compounds of the formula (III)

u is 1 or 2 and r is an integer from 1 to 3, the substituents

Y₁ independently of one another are hydrogen, hydroxyl, phenyl or halogen, halogenomethyl, alkyl having 1 to 12 carbon atoms, alkoxy having 1 to 18 carbon atoms, alkoxy having 1 to 18 carbon atoms which is substituted by a group -COO(C₁-C₁₈alkyl);

if u is 1,

Y₂ is alkyl having 1 to 18 carbon atoms, phenyl which is unsubstituted or substituted by hydroxyl, halogen, alkyl or alkoxy having 1 to 18 carbon atoms;

alkyl which has 1 to 12 carbon atoms and is substituted by -COOH, -COOY₈, -CONH₂, -CONHY₉, -CONY₉Y₁₀, -NH₂, -NHY₉, -NY₉Y₁₀, -NHCOY₁₁, -CN and/or -OCOY₁₁;

alkyl which has 4 to 20 carbon atoms, is interrupted by one or more oxygen atoms and is unsubstituted or substituted by hydroxyl or alkoxy having 1 to 12 carbon atoms, alkenyl

having 3 to 6 carbon atoms, glycidyl, cyclohexyl which is unsubstituted or substituted by hydroxyl, alkyl having 1 to 4 carbon atoms and/or $-\text{OCOR}_{11}$, phenylalkyl which has 1 to 5 carbon atoms in the alkyl moiety and is unsubstituted or substituted by hydroxyl, chlorine and/or methyl, $-\text{COR}_{12}$ or $-\text{SO}_2\text{R}_{13}$, or,

if u is 2,

Y_2 is alkylene having 2 to 16 carbon atoms, alkenylene having 4 to 12 carbon atoms, xylylene, alkylene which has 3 to 20 carbon atoms, is interrupted by one or more $-\text{O}-$ atoms and/or is substituted by hydroxyl, $-\text{CH}_2\text{CH}(\text{OH})\text{CH}_2-\text{O}-\text{Y}_{15}-\text{OCH}_2\text{CH}(\text{OH})\text{CH}_2$, $-\text{CO}-\text{Y}_{16}-\text{CO}-$, $-\text{CO}-\text{NH}-\text{Y}_{17}-\text{NH}-\text{CO}-$ or $-(\text{CH}_2)_m-\text{CO}_2-\text{Y}_{18}-\text{OCO}-(\text{CH}_2)_m$, in which

m is 1, 2 or 3,

Y_8 is alkyl having 1 to 18 carbon atoms, alkenyl having 3 to 18 carbon atoms, alkyl which has 3 to 20 carbon atoms, is interrupted by one or more oxygen or sulfur atoms or $-\text{NT}_6-$ and/or is substituted by hydroxyl, alkyl which has 1 to 4 carbon atoms and is substituted by -

$\text{P}(\text{O})(\text{OR}_{14})_2$, $-\text{NY}_9\text{Y}_{10}$ or $-\text{OCOR}_{11}$ and/or hydroxyl, alkenyl having 3 to 18 carbon atoms, glycidyl, or phenylalkyl having 1 to 5 carbon atoms in the alkyl moiety,

Y_9 and Y_{10} independently of one another are alkyl having 1 to 12 carbon atoms, alkoxyalkyl having 3 to 12 carbon atoms, dialkylaminoalkyl having 4 to 16 carbon atoms or cyclohexyl having 5 to 12 carbon atoms, or Y_9 and Y_{10} together are alkylene, oxaalkylene or azaalkylene having in each case 3 to 9 carbon atoms,

Y_{11} is alkyl having 1 to 18 carbon atoms, alkenyl having 2 to 18 carbon atoms or phenyl,

Y_{12} is alkyl having 1 to 18 carbon atoms, alkenyl having 2 to 18 carbon atoms, phenyl, alkoxy having 1 to 12 carbon atoms, phenoxy, alkylamino having 1 to 12 carbon atoms or phenylamino,

Y_{13} is alkyl having 1 to 18 carbon atoms, phenyl or alkylphenyl having 1 to 8 carbon atoms in the alkyl radical,

Y_{14} is alkyl having 1 to 12 carbon atoms or phenyl,

Y_{15} is alkylene having 2 to 10 carbon atoms, phenylene or a group $-\text{phenylene}-\text{M}-\text{phenylene}-$ in which M is $-\text{O}-$, $-\text{S}-$, $-\text{SO}_2-$, $-\text{CH}_2-$ or $-\text{C}(\text{CH}_3)_2-$,

Y_{16} is alkylene, oxaalkylene or thiaalkylene having in each case 2 to 10 carbon atoms, phenylene or alkenylene having 2 to 6 carbon atoms,

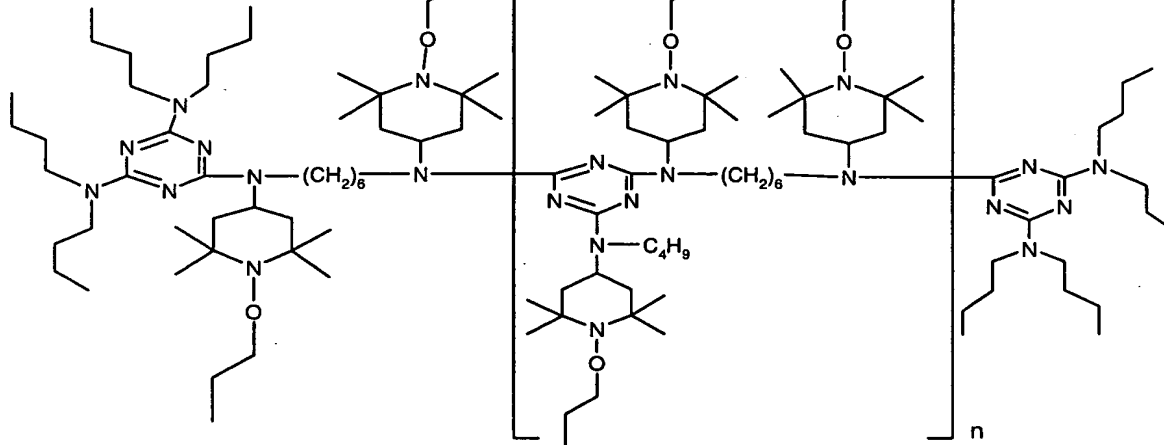
Y_{17} is alkylene having 2 to 10 carbon atoms, phenylene or alkylphenylene having 1 to 11 carbon atoms in the alkyl moiety, and

Y_{18} is alkylene having 2 to 10 carbon atoms or alkylene which has 4 to 20 carbon atoms and is interrupted once or several times by oxygen;

in the compounds of the formula (IV) x is an integer from 1 to 3 and the substituents L independently of one another are hydrogen, alkyl, alkoxy or alkylthio having in each case 1 to 22 carbon atoms, phenoxy or phenylthio.

4. A polymer composition according to claim 1 wherein the total amount of UV-absorber is from 0.005 to 5% based on the weight of the polymer.

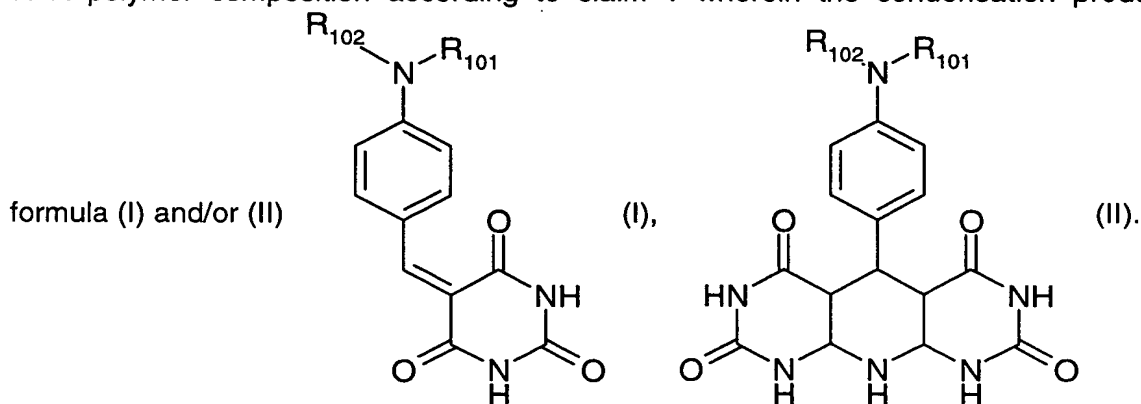
5. A polymer composition according to claim 1 wherein the sterically hindered amine is selected from the group consisting of bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(2,2,6,6-tetramethyl-4-piperidyl)succinate, bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(1,2,2,6,6-pentamethyl-4-piperidyl) *n*-butyl-3,5-di-*tert*-butyl-4-hydroxybenzylmalonate, the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid, linear or cyclic condensates of *N,N'*-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-*tert*-octylamino-2,6-dichloro-1,3,5-triazine, tris(2,2,6,6-tetramethyl-4-piperidyl)nitritotriacetate, tetrakis(2,2,6,6-tetramethyl-4-piperidyl)-1,2,3,4-butane-tetracarboxylate, 1,1'-(1,2-ethanediyl)-bis(3,3,5,5-tetramethylpiperazinone), 4-benzoyl-2,2,6,6-tetramethylpiperidine, 4-stearyloxy-2,2,6,6-tetramethylpiperidine, bis(1,2,2,6,6-pentamethylpiperidyl)-2-*n*-butyl-2-(2-hydroxy-3,5-di-*tert*-butylbenzyl)malonate, 3-*n*-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decan-2,4-dione, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate, linear or cyclic condensates of *N,N'*-bis-(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, the condensate of 2-chloro-4,6-bis(4-*n*-butylamino-2,2,6,6-tetramethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, the condensate of 2-chloro-4,6-di-(4-*n*-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis-(3-aminopropylamino)ethane, 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione, 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidin-2,5-dione, 3-dodecyl-1-(1,2,2,6,6-pentamethyl-4-piperidyl)pyrrolidine-2,5-dione, a mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine, a condensation product of *N,N'*-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine, a condensation product of 1,2-bis(3-aminopropylamino)ethane and 2,4,6-trichloro-1,3,5-triazine as well as 4-butylamino-2,2,6,6-tetramethylpiperidine (CAS Reg. No. [136504-96-6]); *N*-(2,2,6,6-tetramethyl-4-piperidyl)-*n*-dodecylsuccinimid, *N*-(1,2,2,6,6-pentamethyl-4-piperidyl)-*n*-dodecylsuccinimid, 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxo-spiro[4,5]decane,



in which n is from 1 to 15.

6. A polymer composition according to claim 1 wherein the sterically hindered amine compound is present in an amount of from 0.005 to 5 % by weight, based on the weight of the polymer.

7. A polymer composition according to claim 1 wherein the condensation product is of

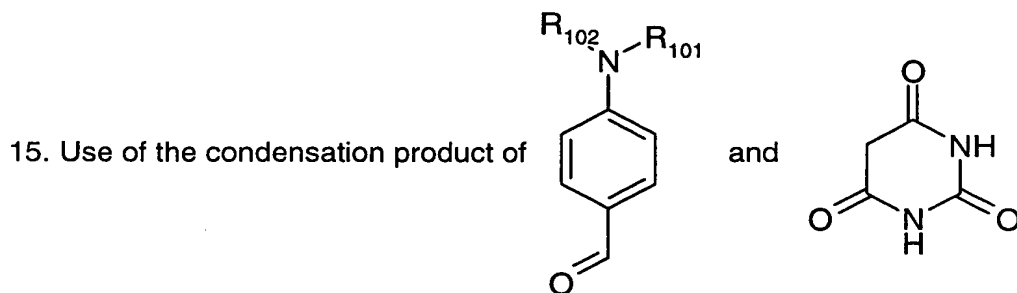


formula (I) and/or (II)

(1),

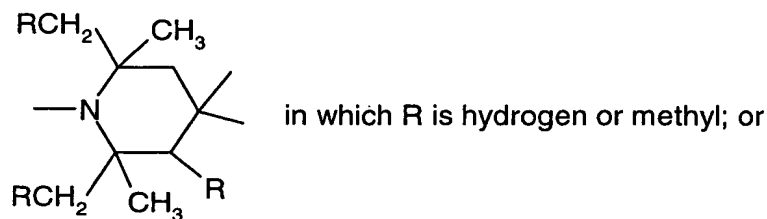
(II).

8. A polymer composition according to claim 1 wherein R_{101} and R_{102} are methyl.
9. A polymer composition according to claim 1 wherein the condensation product is present in an amount of from 0.005% to 10% by weight based on the weight of the thermoplastic polymer.
10. A polymer composition according to claim 1 wherein the thermoplastic polymer is selected from the group consisting of a polyolefin, a polyester, a polyvinylalcohol, a polyvinylacetate and a polycarbonate.
11. A polymer composition according to claim 1, which is in the form of a film with a thickness from 10 μ to 300 μ .
12. A polymer composition according to claim 11 wherein the film is a multilayer construction of between 2 and 7 polymer layers containing the condensation product, component b) and the components c1), c2) or c3) according to claim 1 in at least 1 layer.
13. A polymer composition according to claim 1 containing an additional additive, selected from the group consisting of a phenolic antioxidant, a phosphite or phosphonite, a further fluorescent dye or pigment, a processing aid, a filler or reinforcing material and an antifog additive.
14. A process for enhancing plant growth, comprising exposing a plant to actinic radiation behind or under a thermoplastic polymer composition according to claim 1.

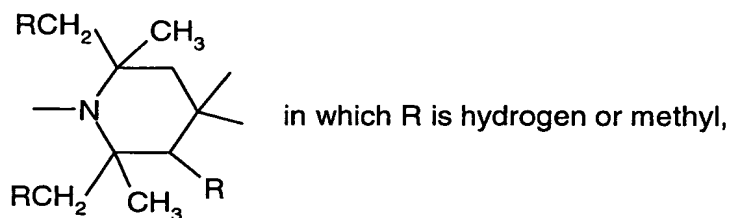


wherein R_{101} and R_{102} are independently hydrogen or C_1 - C_{18} alkyl together with a UV-absorber; or

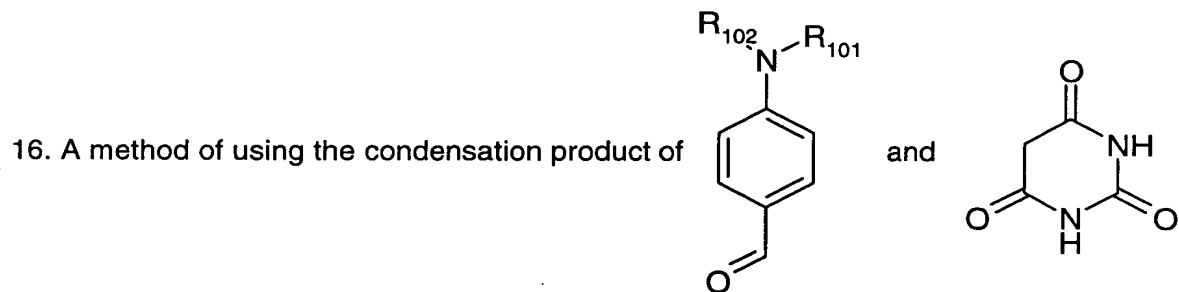
a sterically hindered amine, containing at least one radical of the formula



a UV-absorber and a sterically hindered amine, containing at least one radical of the formula

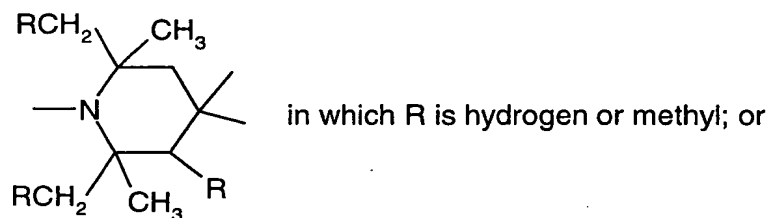


as plant growth enhancing additive in thermoplastic polymers for agricultural applications in the form of films for greenhouses and small tunnel covers, films or filaments for shading nets and screens, mulch films, non-wovens or molded articles for the protection of young plants.

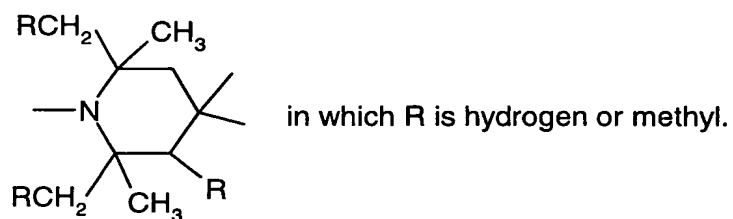


wherein R_{101} and R_{102} are independently hydrogen or C_1 - C_{18} alkyl together with a UV-absorber; or

a sterically hindered amine, containing at least one radical of the formula



a UV-absorber and a sterically hindered amine, containing at least one radical of the formula



as plant growth enhancing additive in thermoplastic polymers for agricultural applications in the form of films for greenhouses and small tunnel covers, films or filaments for shading nets and screens, mulch films, non-wovens or molded articles for the protection of young plants.